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by Sébastien LaRochelle-Côté and Darcy Hango

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Overview of the study

Based on a self-reported measure of overqualification, this article examines the association between overqualification and skills among workers aged 25 to 64 with a university degree, using data from the 2012 Programme for the International Assessment of Adult Competencies (PIAAC). This article also examines the extent to which overqualified workers are dissatisfied with their jobs. Overqualified workers are defined in this study as university-educated workers who reported that they were in a job requiring no more than a high school education.

- In 2012, about 12% of workers aged 25 to 64 with a university degree reported that they were working in a job that did not require more than a high school education (i.e., they were "overqualified"). Another 19% said that their job required a college education, while 69% said that their job required a university education.
- Among overqualified university graduates aged 25 to 64, 47% had lower literacy skills and 54% had lower numeracy skills. Having a lower skill level is defined as obtaining a level 2 or lower (out of 5) on tests administered by PIAAC.
- The factors associated with overqualification are not necessarily the same for lower-skilled and higher-skilled university graduates. Having a mother tongue other than English or French, for example, was significantly associated with overqualification for those with a lower skill level, but not for those with a higher skill level.
- Overqualified university graduates use fewer skills in the workplace. For example, they performed 25% of the information and communications technology (ICT) activities listed in PIAAC on a weekly basis, compared with 55% for those who reported that their job required a university education.
- After accounting for other factors that are related to job satisfaction, about 13% of overqualified university graduates were not satisfied with their job in 2012. This compared with 3% for those who were in a university-level position.

Introduction

Canada has one of the most educated workforces in the developed world. In 2014, about 28% of the Canadian population aged 25 to 64 had earned a bachelor's degree or higher—identical to the Organisation for Economic Co-operation and Development (OECD) average of 28%.[1] From 1990 to 2015, the proportion of those aged 25 to 64 holding a university degree increased (from 14% to 30%), with a particularly large increase among women (from 12% to 32%).[2] Canada's immigration system is also skewed in favour of those who have a university degree, and the children of immigrants are far more likely to get a university education than the Canadian-born.[3] All of these factors suggest that Canada benefits from a strong supply of university graduates.

The increase in the supply of university graduates, including those with a foreign education, has led to concerns that the Canadian economy is not creating enough jobs for those who are university-educated,[4]

and that too many graduates would be forced to work in lower-level occupations. These "overqualified" university graduates would face a higher risk of unemployment, lower earnings, skill loss, and lower levels of job satisfaction.[5] In addition, the resource-based growth of the late 2000s might also have changed labour demand for lower-skilled jobs, especially among younger workers. Recent research indicates that, even though workers with a university degree continue to earn more than less-educated workers, the relative gains of university graduates have declined since the early 2000s—especially in resource-rich provinces.[6]

In spite of the above, a recent study showed that overqualification rates did not change considerably over two decades. According to the study, approximately 15% of workers with a university degree were in a job requiring no more than a high school diploma in 2011—almost as many as in 2001 and 1991.[7] Some categories of university graduates, however, were more at risk of overqualification than others, including immigrants who have a foreign degree, and graduates who have a degree in the humanities, languages and arts.[8]

Overqualification, however, is a form of educational mismatch, and is not a measure of skills mismatch. Because some university graduates have lower levels of literacy and numeracy skills,[9] could it be that individuals are "overqualified" because they do not have the skills required for jobs that match their level of education?

In this paper, the relationship between overqualification (or credential mismatch) and information-processing skills—as measured by tests administered by the Programme for the International Assessment of Adult Competencies (PIAAC)—is examined. This study also examines the range of skills used on the job by overqualified workers, and concludes by examining whether overqualification leads to higher levels of job dissatisfaction among Canadian workers aged 25 to 64.

Measurement of overqualification and skills in PIAAC

Overqualification, which refers to educational mismatch between worker's educational attainment and the level of education required for their job, can be measured in numerous ways.

One method consists of examining whether the skill level of jobs held by survey respondents matches their highest level of educational attainment, based on a predetermined classification of occupations across skill levels—the National Occupation Classification (NOC).[10] With this method, also called job analysis (JA), overqualification can be calculated by taking the proportion of university-educated workers who are in a job requiring no more than a college diploma, or the proportion of those who are in a position requiring no more than a high school diploma. According to PIAAC, less than 15% of university-educated workers were employed in occupations that did not require more than a high school education in 2012.

The measure described above, however, is not without caveats. First, workers within detailed categories of occupations may or may not use the skills deemed "normally required" for the occupation, depending on their employer, their experience, or position within a firm. Second, it ignores other contributors of human capital, such as training, past work experience, or informal learning, and does not account for field of study mismatch.[11]

Another method, called worker self-assessment (WA), consists of asking survey respondents if they believe that their level of education is appropriate for their job.[12] In PIAAC, it takes the form of the following question: "If applying today, what would be the usual educational qualification required for your position?" Overqualified individuals can be identified by calculating the number of university graduates who self-reported that their position required a lower level of education.

In 2012, for example, 12% of university graduates aged 25 to 64 indicated that their position required no more than a high school diploma—a percentage relatively close to the one obtained using the NOC. There is also a strong degree of overlap between both measures.[13]

Because this paper is concerned with the link between qualification mismatch and the information-processing skills of respondents (including literacy and numeracy), the WA method was preferred over the JA method. The WA method may be better aligned with skill and job satisfaction indicators since they are based on what respondents experience in their jobs.[14] Readers should note, however, that similar results were found with the other method (JA).[15]

In PIAAC, information on numeracy and literacy skills comes from tests administered to survey respondents. Literacy refers to respondents' ability to understand and use written

text both in print and electronic format, while numeracy refers to adults' ability to evaluate, use, and communicate numerical and mathematical concepts.[16] Respondents can be classified by skill level, ranging from 0 to 5 (see *Data sources, methods and definitions*).

In this paper, and in line with earlier work on this topic, individuals with a lower skill level are those with a level 2 or lower in literacy (numeracy skill levels yield similar results, given the close correlation between the two measures). Conversely, individuals whose score is level 3 or higher are deemed to have a higher skill level. Adults with a level 3 or higher have been shown to have a better mastery of skills related to literacy and numeracy, and generally have more positive social and educational outcomes.[17]

Overqualification is associated with lower literacy and numeracy among university graduates

As indicated above, 12% of working adults aged 25 to 64 with a university education stated that their job only required a high school education. Another 19% thought that their job required a college-level education, and more than two-thirds (69%) of those with a university education reported that their job required a university education. In the sections that follow, the "overqualified" population refers to the 12% who reported that their job required no more than a high school education.

The proportion of those who reported that their jobs required no more than a high school diploma did not vary across age groups or gender, but varied across other socioeconomic characteristics (Table 1). For example, 27% of foreign-born workers with a foreign

Table 1
Distribution of workers aged 25 to 64 with a university degree by skill level of current job, 2012

	Distribution across characteristics	In a job requesting a high school-level education or lower	In a job requesting a college-level education	In a job requesting a university-level education
		percent		
Total	**100.0**	**12.2**	**19.1**	**68.7**
Gender				
Male (ref.)	48.1	12.3	17.3	70.4
Female	51.9	12.2	20.7**	67.1
Age group				
25 to 39 (ref.)	43.8	12.3	17.2	70.6
40 to 54	38.5	11.9	21.4**	66.7
55 to 64	17.7	13.2	19.1	67.7
Place of birth, location of highest degree				
Born in Canada (all locations) (ref.)	61.6	8.1	16.0	75.8
Foreign-born / Canadian degree	13.5	4.7**	18.2	77.0
Foreign-born / Foreign degree	24.9	26.6**	27.5**	45.9**
Field of study				
STEM[1] (ref.)	29.6	9.6	21.3	69.1
Humanities, languages, arts	13.8	21.1**	23.3	55.6**
Social science, business, law	31.0	13.5**	19.7	66.8
Teacher and related	15.3	8.4	12.1**	79.5**
Health and welfare	10.4	6.3	17.0	76.7*
Literacy proficiency level				
Level 0 or 1	6.0	34.1**	31.2	34.6**
Level 2 (ref.)	21.1	20.6	24.7	54.7
Level 3	44.0	9.9**	19.6	70.5**
Level 4 or 5	29.0	6.8**	12.9**	80.3**
Numeracy proficiency level				
Level 0 or 1	8.3	32.5**	29.0	38.5**
Level 2 (ref.)	23.3	18.5	23.2	58.3
Level 3	42.0	9.3**	18.8	71.9**
Level 4 or 5	26.4	6.2**	13.7**	80.1**
Province/region				
Atlantic	5.4	9.2*	12.5**	78.3**
Quebec	21.5	8.1**	16.9	75.0**
Ontario (ref.)	42.7	12.7	18.0	69.4
Manitoba and Saskatchewan	5.2	15.2	18.4	66.4
Alberta	11.3	13.0	23.2	63.8
British Columbia and the territories	14.0	16.9	26.0**	57.1**
Mother tongue				
English (ref.)	46.8	9.1	17.4	73.5
French	17.5	4.7**	14.3*	81.0**
Other	35.6	20.4**	24.1**	55.5**
Lives with spouse/partner				
No (ref.)	24.3	14.9	19.7	65.3
Yes	75.7	11.4**	18.9	69.7
Has a child in the home				
No (ref.)	32.6	11.5	19.1	69.4
Yes	67.4	12.6	19.1	68.2
Extent of long-term illness/health problem				
No health limitation (ref.)	73.6	12.2	18.7	69.1
Illness exists but is not limiting	12.8	9.7	17.9	72.3
Illness is limiting, including severely	13.6	15.2	23.4*	61.4**

* significantly different from the reference category (ref.) at $p < 0.1$; ** $p < 0.05$

1. Science, technology, engineering, mathematics, and computer science.

Source: Statistics Canada, Programme for the International Assessment of Adult Competencies (PIAAC), 2012.

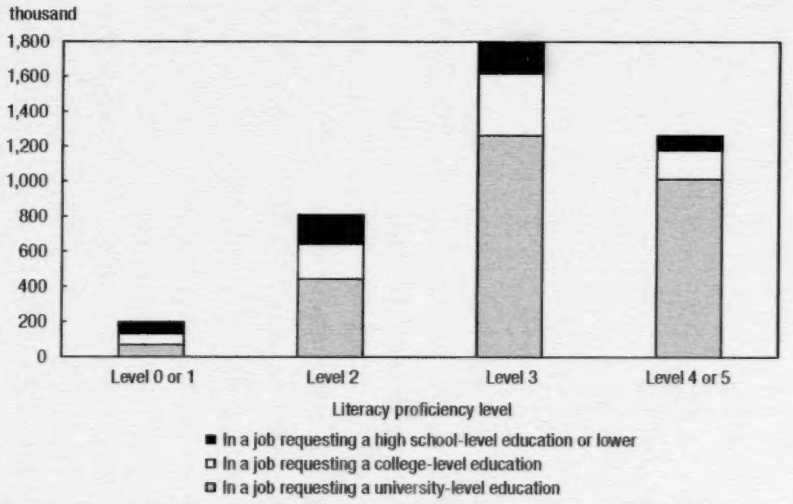
university degree reported that they were in a job requiring a high school education, compared with 8% of the Canadian-born and 5% of foreign-born workers who obtained their university degree from a Canadian institution. Furthermore, 20% of university graduates whose mother tongue was neither English nor French said they were working in a job that required no more than a high school diploma.

In addition, 21% of those who had a degree in humanities, languages or arts said that they were working in a high school-level position. This compared with 14% for those who had a degree in social science, business or law; 10% for those who had a degree in science, technology, engineering and mathematics (STEM); and percentages below 10% for those who had a degree in health and education disciplines. These two findings concur with the existing literature, which also identified the location of study and field of study as factors significantly correlated with overqualification.[18]

As expected, literacy and numeracy skill levels were also correlated with overqualification. Among university graduates whose literacy skills were in the lowest range (levels 0 and 1), more than one-third (34%) reported that their current job required no more than a high school education, while 21% of those with a level 2 in literacy reported as much. In comparison, 10% of university graduates with a level 3 and 7% of those with a level 4 or level 5 reported that their job required no more than a high school diploma.[19] The numeracy results were similar.

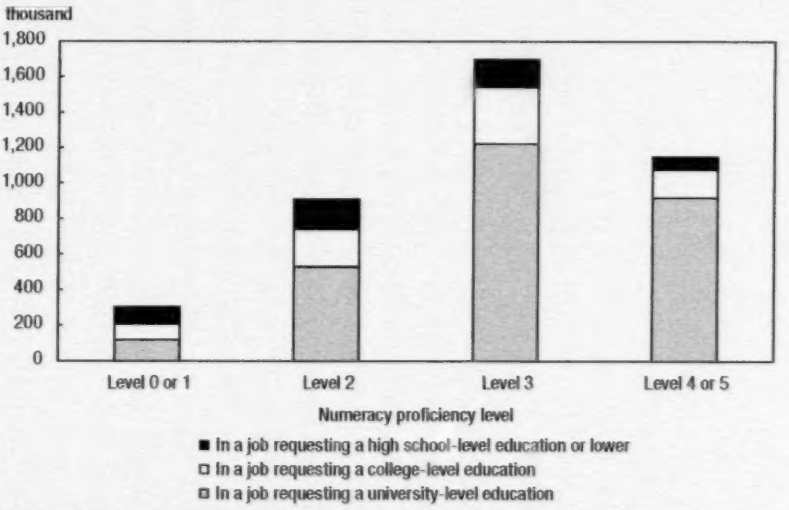
It is important to keep in mind that university graduates with a lower skill level do not constitute the majority of university graduates (Chart 1.1). In 2012, out of a total

Chart 1.1
Number of university graduates aged 25 to 64 in jobs requesting a high school-level, a college-level or a university-level education, by literacy proficiency level, 2012



Source: Statistics Canada, Programme for the International Assessment of Adult Competencies (PIAAC), 2012.

Chart 1.2
Number of university graduates aged 25 to 64 in jobs requesting a high school-level, a college-level or a university-level education, by numeracy proficiency level, 2012



Source: Statistics Canada, Programme for the International Assessment of Adult Competencies (PIAAC), 2012.

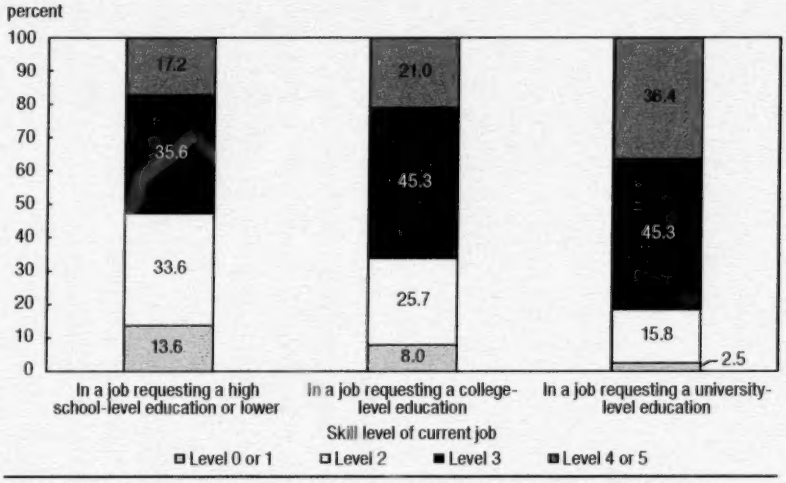
of approximately 4 million adult workers aged 25 to 64 with a university education, about 3 million had a higher literacy level (level 3 or higher), and they were therefore less likely to be overqualified. The risk of overqualification was higher among university graduates with lower literacy skills (level 2 or lower)—about 235,000 (out of 1 million) reported that they were working in an occupation requiring no more than a high school education. Similarly, out of 1.2 million university graduates with lower numeracy skills, about 268,000 said that they were working in an occupation requiring a high school diploma or less education (Chart 1.2).

Another useful way to examine the close association between skills and overqualification is to look at the proportion of overqualified university graduates who have a lower level of literacy (or numeracy).

In 2012, nearly one half (47%) of university graduates who were working in a high school-level position had a level 2 or lower in literacy (Chart 2.1). Similar results were found with numeracy scores: about 54% of university graduates working in a high school-level position scored a level 2 or lower in numeracy, while 46% had at least a level 3 (Chart 2.2).

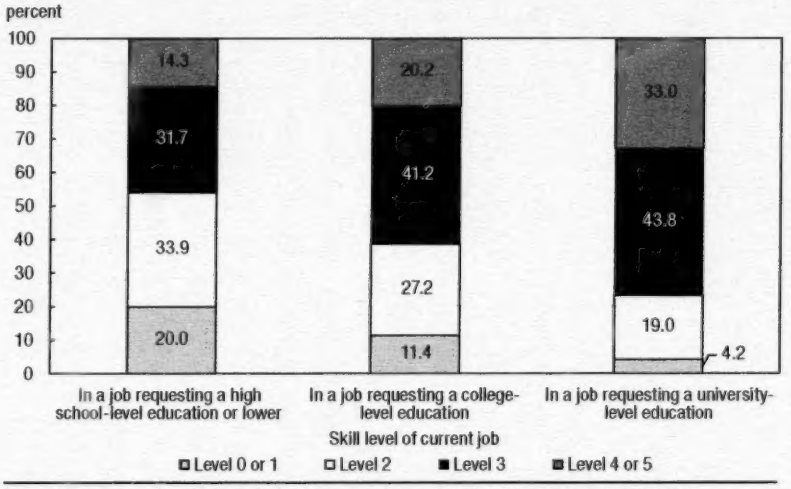
In comparison, among those who reported that they were in a job requiring a university education, 18% had lower levels of literacy skills and 23% had lower levels of numeracy skills.

Chart 2.1
Distribution of workers aged 25 to 64 with a university degree across literacy proficiency levels, by skill level of current job, 2012



Source: Statistics Canada, Programme for the International Assessment of Adult Competencies (PIAAC), 2012.

Chart 2.2
Distribution of workers aged 25 to 64 with a university degree across numeracy proficiency levels, by skill level of current job, 2012



Source: Statistics Canada, Programme for the International Assessment of Adult Competencies (PIAAC), 2012.

The factors associated with overqualification vary by skill level

In this section, the factors associated with overqualification (i.e., working in a job requiring a high school education or less) are examined separately for those with higher and lower skill levels.

The overqualified with lower skills may be in that situation because of skills attrition over time, or because employers naturally select individuals with higher skills to occupy jobs that require a university education.[20]

Overqualified workers with higher skills, by contrast, represent a different population. They may represent a productivity loss to the Canadian economy, given that they presumably would have the capacity to occupy jobs that require more skills, yet they are in jobs that require no more than a high school education. Having a higher skill level may suggest inefficiencies in the labour market or simply imply differences in preferences of individuals (such as the desire to work in a less stressful or less demanding workplace). Understanding the factors associated with overqualification for each of these populations is therefore important.

Results are derived from logistic regression models and expressed as predicted probabilities. A probability of 1 indicates a 100% probability of being overqualified, and a probability close to 0 indicates a low probability of being overqualified.

Results indicate that, all else being equal, there appears to be a significant association between location of study, field of study, mother tongue and the probability of being overqualified (Table 2). The magnitude and significance of

Table 2
Predicted probability of being overqualified (working in a job requiring high school education or less) among workers aged 25 to 64 with a university degree, 2012

	High skilled (level 3 and above)		Low skilled (level 2 or below)	
	Literacy	Numeracy	Literacy	Numeracy
	percent			
Gender				
Male (ref.)	5.5	5.4	18.6	18.0
Female	6.8	6.1	15.2	14.3
Age group				
25 to 39 (ref.)	6.6	5.9	16.9	16.7
40 to 54	5.3	5.2	16.6	14.7
55 to 64	7.1	6.8	16.2	15.5
Place of birth, location of highest degree				
Born in Canada (all locations) (ref.)	6.0	5.7	16.1	13.8
Foreign-born / Canadian degree	2.6**	2.5**	4.1	3.8*
Foreign-born / Foreign degree	13.6**	11.1	25.3	27.5
Field of study				
STEM[1] (ref.)	4.6	4.4	11.2	11.4
Humanities, languages, arts	14.6**	12.3**	30.1**	29.5**
Social science, business, law	7.2	6.4	24.2**	21.8**
Teacher and related	5.5	5.9	12.9	9.8
Health and welfare	3.0	3.4	12.5	9.4
Province/region				
Atlantic	6.6	6.7	20.9	15.0
Quebec	6.1	5.8	15.5	14.7
Ontario (ref.)	5.2	4.6	16.3	16.1
Manitoba and Saskatchewan	8.1	8.5	24.9	18.2
Alberta	8.3	8.0	13.2	12.7
British Columbia and the territories	6.9	6.5	19.7	17.6
Mother tongue				
English (ref.)	6.2	5.8	8.7	10.3
French	3.3**	2.8**	7.2	8.6
Other	9.8	9.8	24.6*	22.9*
Lives with spouse/partner				
No (ref.)	8.6	8.2	25.4	22.0
Yes	5.5*	5.1*	14.5*	13.8
Has a child in the home				
No (ref.)	6.0	5.5	13.5	13.8
Yes	6.2	5.9	18.0	16.5
Extent of long-term illness/health problem				
No health limitation (ref.)	6.0	5.6	16.0	15.3
Illness exists but is not limiting	5.0	4.5	18.4	18.1
Illness is limiting, including severely	8.4	9.0	19.6	15.4
Aboriginal status				
Not of Aboriginal descent (ref.)	6.1	5.7	16.5	15.5
Of Aborginal descent	9.6	8.7	29.1	28.0
Parental education				
Both have less than a high school diploma	4.7	4.0	13.6	13.9
At least one has a high school diploma	5.9	5.3	23.8	21.6*
At least one has a postsecondary education / less than a bachelor's degree	7.5	6.7	16.4	17.6
At least one has a university degree (ref.)	5.9	5.9	15.5	12.4
Number of books in the home at age 16				
25 or less (ref.)	6.3	5.8	17.7	16.1
26 to 100	6.4	6.4	15.8	14.1
More than 100	5.9	5.4	16.6	17.0
	number			
Unweighted sample size	3,232	2,942	1,043	1,333
Weighted sample size	3,010,723	2,737,637	908,558	1,181,644

* significantly different from the reference category (ref.) at $p < 0.1$; ** $p < 0.05$
1. Science, technology, engineering, mathematics, and computer science.
Note: Average marginal predicted probabilities are based on logistic regressions.
Source: Statistics Canada, Programme for the International Assessment of Adult Competencies (PIAAC), 2012.

these associations, however, varied between the populations with high and low skill levels.

For example, among those who had higher literacy skills, foreign-born workers who received their highest university degree outside Canada were significantly more likely (14%) to be overqualified than Canadian-born workers (6%).[21] At the same time, foreign-born workers who were trained in Canada had the lowest probability of being overqualified (3%). Similar findings were noted for workers with higher numeracy skills (although the difference between foreign-born workers with a foreign degree and Canadian-born workers was no longer significant).

Within the lower skilled population, the numeracy model results indicate a significant difference between foreign-born workers who earned their degree in Canada (with a 4% probability to be overqualified) and those who were born in Canada (14%). In both models, the foreign-born and foreign-educated had a predicted probability above the 25% range.

Graduates of humanities, languages and arts programs had a significantly greater probability of being overqualified than graduates of STEM programs, regardless of skill level. However, among workers with higher literacy skills, the gap between graduates of these programs was 10 percentage points (15% versus 5%), while for those with lower literacy skills, the gap was 19 percentage points (30% versus 11%). At the same time, graduates of social science, business and law programs with lower literacy skills had a significantly greater probability of being overqualified (24%) than their lower-skilled counterparts in STEM programs (11%); that difference was much smaller among higher-skilled graduates (7% versus 5%).

In addition, university graduates with higher skill levels whose mother tongue is French were significantly less likely to be overqualified (3%) than either English speakers (6%) or those with a mother tongue other than English or French (10%).

Among those with lower skill levels, graduates with lower literacy skills whose mother tongue was a language other than English or French had a significantly higher probability of being overqualified (25%).

Lastly, the results also indicate that conjugal status is related to the probability of being overqualified. All else being equal, workers who live with a spouse or partner, regardless of skill level, have a significantly lower probability of being overqualified than those who do not live with a spouse or partner. Given that the results have a 10% level of significance, they must be interpreted with caution; such results, however, might be related to the selectivity of individuals who are married or in a common-law relationship.[22]

Fewer complex activities are performed by overqualified university graduates in the workplace

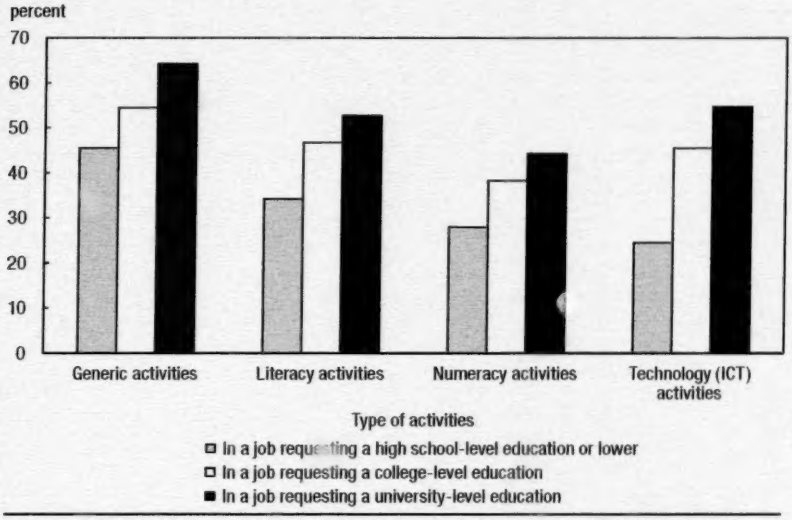
The relationship between overqualification and skills is not unidirectional. While university graduates' lack of skills might lead them to occupy a lower-skilled job, it could also be that some university graduates are less skilled because they occupy a lower-skilled job and thus have fewer opportunities to use, maintain or gain skills than their counterparts in jobs that require more skills.[23]

Given the cross-sectional nature of the data, it is difficult to formally identify a cause-and-effect relationship between overqualification and lower skill levels. In PIAAC, however, survey respondents are asked a number of questions on weekly activities at work—including literacy activities, numeracy activities, and information and communications technology (ICT) (or "technology") activities. Questions were also asked about generic (or "soft skill") activities such as instructing people, giving presentations, persuading or influencing people, and thinking about complex problems. A total of 12 question items were used to identify the use of generic activities in the workplace. Another 7 were about ICT activities, 12 were about literacy activities and 6 were about the use of numeracy activities.[24]

To get a sense of the extent to which workers use complex skills, a statistical indicator of the workplace activities can be calculated. We do so by calculating the number of activities used in the workplace on a weekly basis for each employed individual, and by averaging the results obtained across all labour market participants. For example, university-educated workers who were in a university-level occupation performed, on average, 7.7 of the 12 generic activities listed in PIAAC on a weekly basis (7.7/12*100=64%). These university graduates also performed 53% of literacy activities, 44% of numeracy activities and 55% of ICT activities listed in PIAAC on a weekly basis (Chart 3).

The results indicate that overqualified workers (i.e., working in a high school position or lower) performed fewer activities in the workplace than those who occupied a university-level position. For example, overqualified workers performed 25% of ICT activities on a weekly

Chart 3
Average number of activities performed in the workplace by university-educated workers aged 25 to 64 on a weekly basis (as a proportion of activities listed in PIAAC), by skill level of current job, 2012



Source: Statistics Canada, Programme for the International Assessment of Adult Competencies (PIAAC), 2012.

basis; this compared with 55% among those who were in a position requiring a university education.[25] In all other categories (use of literacy, numeracy and generic skills), there was nearly a 20 percentage point difference between those who were in a high school-level position and those who were in a university-level position. Such results increase the possibility that the lack of skill use may contribute to a deterioration of the skill level of workers with a university education, especially if they are working in a job that requires a high school diploma or less education.

Overqualification and job satisfaction

It is generally assumed that overqualified workers are less satisfied with their jobs than those who are not overqualified for their jobs.[26] Generally speaking, overqualified workers who are less satisfied may be more willing to leave their current job in order to find one that better matches their credentials or skill level. Moreover, higher levels of dissatisfaction may also be related to lower productivity.

The issue of overqualification and job satisfaction, however, has been studied little in Canada. Studies either examine overqualification[27] or job satisfaction,[28] but the connection between the two is lacking in the Canadian literature.[29] With that in mind, what can be said about the relationship between job satisfaction and overqualification in Canada?

According to PIAAC data, most university graduates are satisfied with their jobs. In 2012, 84% of university graduates aged 25 to 64 said they were satisfied or extremely satisfied with their jobs, compared with 10% who were neither satisfied nor dissatisfied, and 6% who were dissatisfied or extremely dissatisfied. In fact, at all levels of completed education, a similar level of satisfaction was observed.[30]

To study the relationship between job satisfaction and overqualification, an ordered probit model was conducted on the sample of university graduates.[31] Three possible ordered outcomes were considered in the model: (1) dissatisfied or extremely dissatisfied; (2) neither satisfied nor dissatisfied; and (3) satisfied or extremely satisfied. In addition to overqualification, variables that may be related to job satisfaction were included as controls (including gender, age, region of residence, health status, immigrant status and location of study of highest level of education, and earnings).[32] Literacy skill levels were also included as a control variable in this model. The results discussed below are expressed as marginal probabilities, and indicate the probability that workers will either be dissatisfied, neutral or satisfied with their job when all other control variables are taken into account and held at average values.

Results indicate that 13% of university graduates who considered themselves to be in a job requiring a high school diploma or less education were dissatisfied with their job, compared with 3% of those who were in a job requiring a university education—indicating that there is a statistical difference in the level of job dissatisfaction between those who are overqualified and those who are not overqualified (Chart 4).

Conversely, the predicted probabilities indicate that 68%, or two-thirds, of university graduates who were in a job requiring no

more than a high school diploma were satisfied with their job, while 19% were neither satisfied nor dissatisfied. This compared with 88% and 8%, respectively, for those who were in a university-level job.

Hence, overqualified university-educated workers have a significantly higher probability of being dissatisfied with their current job than their university-educated counterparts whose qualifications are a better match. Although this was the expected result, it is important to note that this result remains even when other factors are taken into account. Future research is needed to gain more insight into the relationship between overqualification and job satisfaction.

Conclusion

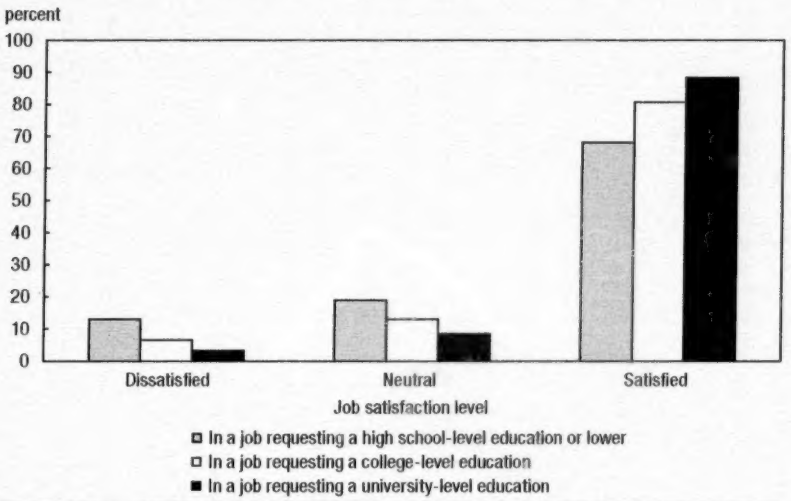
Canada's university graduates generally perform well in the labour market in both the short and long term.[33] Their rates of employment exceed those of their counterparts with a high school diploma and even those with other postsecondary diplomas. However, for various reasons, including lower literacy and numeracy skills,[34] not all university graduates are well placed in the labour market. When a worker occupies a position that requires much less education than they possess, it is considered a qualification mismatch, which may affect job satisfaction, job retention and earnings. This is qualitatively different from situations where there is a skills mismatch. The latter occurs when a university graduate works in a position where they lack the skills (such as literacy) to carry out the duties and tasks of the job.

A vast amount of past work used a measure of qualification mismatch based on the National Occupational Classification (NOC). However, it is not without its limitations, and, in this study, a self-assessed qualification mismatch measure was used to supplement the comprehension of issues that are related to highly educated individuals working in jobs that require much lower levels of education. According to the results, approximately 12% of university workers aged 25 to 64 say they are working in a job that only requires a high school diploma. The percentage of overqualification using the NOC is similar at less than 15%.

This study shows that overqualification is typically associated with lower levels of literacy and numeracy. Some of the characteristics associated with overqualification were similar regardless of skill level, especially with respect to field of study. Other factors, such as mother tongue, had a larger impact within the lower-skilled population.

The overqualified university-educated population was also less likely to perform literacy, numeracy or ICT activities in the workplace. They were also less likely to perform so-called 'generic' skills such as thinking about complex problems or influencing people. The less-frequent use of those activities over time may effectively impact their ability to maintain and strengthen their skills and possibly obtain a job that is more matched to their

Chart 4
Job satisfaction level of workers aged 25 to 64 with a university degree, by skill level of current job, 2012



Notes: Results are marginal probabilities derived after an ordered probit. These results control for literacy, gender, age, location of study, field of study, province, self-reported health and income.
Source: Statistics Canada, Programme for the International Assessment of Adult Competencies (PIAAC), 2012.

level of education. Lastly, university-educated workers with jobs that required no more than a high school diploma had lower levels of job satisfaction, even after controlling for many factors including earnings.

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Data sources, methods and definitions

Data sources

The Programme for the International Assessment of Adult Competencies (PIAAC) is an international collaborative effort between the Organisation for Economic Co-operation and Development (OECD) and numerous other international organizations. Canada is one of 24 countries and subnational regions that participated in the first round of PIAAC. The survey, which was administered by Statistics Canada from November 2011 to June 2012, was conducted in collaboration with and with support from Employment and Social Development Canada (ESDC), the Council of Ministers of Education, Canada (CMEC) and many other partners, including provincial and territorial ministries and departments responsible for education. PIAAC is a complex survey of the information-processing skills of youth and adults between the ages of 16 and 65. The PIAAC survey contains three main parts—a background questionnaire, a direct assessment and a module on the use of skills.

Methods

Overqualification

In this paper, the main measure of overqualification is derived from the following question asked of respondents: **"Again referring to your current job: If applying today, what would be the usual educational qualification required, if any, to qualify for your position?"** The respondent could choose between 12 different qualification levels from "no formal education or below grade 6" to "Ph.D.".

The approach of using self-assessment is a relatively novel method for studying overqualification, therefore it must be compared with a more standard method using the National Occupational Classification (NOC). Occupations are classified into four levels in the NOC:

- **Skill Level A** includes occupations that normally require a university education (includes managerial occupations)
- **Skill Level B** includes occupations that require a college education (includes trades and apprenticeships)
- **Skill Level C** includes occupations that normally require high school and/or occupation-specific training
- **Skill Level D** includes occupations for which on-the-job training is provided.

Either the census or the Labour Force Survey (LFS) is typically used to examine overqualification within the NOC. PIAAC, the survey currently used, also includes NOC codes, which makes a comparison between the self-assessment and NOC methods possible.

Based on the NOC, less than 15% of university graduates were working in occupations requiring a high school diploma or less education, which is slightly higher than the 12% estimated via self-assessment.

Of the 12% who were found to be overqualified using the self-assessment, nearly 8% (or almost two thirds) would also have been overqualified using the NOC (Table 3). Conversely, of the 69% who considered themselves as having a job requiring a university education, 3% were overqualified on the basis of the NOC. All analyses in this report were also estimated using the NOC version of overqualification. No substantive changes were found. These results are available upon request.

Table 3
Distribution of workers aged 25 to 64 with a university degree across skill level categories, worker self-assessment method and NOC[1] method, 2012

	NOC 2011 method			
	Skill level C/D: High school or less	Skill level B: College	Skill level A: University and managers	Total
	percent			
Self-assessment method				
High school-level position or lower	7.5	3.6	1.0	12.1
College-level position	4.2	9.2	5.6	19.0
University-level position	2.8	13.1	53.0	68.9
Total	14.5	25.9	59.6	100.0

1. National Occupational Classification.

Source: Statistics Canada, Programme for the International Assessment of Adult Competencies (PIAAC), 2012.

Literacy

Respondents are evaluated on their ability to engage with written texts (print-based and digital), which is associated with participation in society, goal achievement, and the development of knowledge and potential. This requires accessing, identifying and processing information from a variety of texts that relate to a range of settings.

Data sources, methods and definitions (concluded)

Numeracy

Respondents are evaluated on their ability to engage with mathematical information in order to manage the mathematical aspects of a range of situations in everyday life. This requires understanding mathematical content and ideas (e.g., quantities, numbers, dimensions and relationships), and the representation of that content (e.g., objects, pictures, diagrams and graphs).

Skill proficiency levels

Individuals with a level 3 proficiency or higher are those who scored more than 275 (out of 500) on the literacy and numeracy assessments, and are defined as those who are in the upper range for literacy or numeracy. Note that these proficiency levels "do not represent strict demarcations between abilities but instead describe a set of skills that individuals possess to a greater or lesser degree. This means that individuals scoring at lower levels are not precluded from completing tasks at a higher level – they are simply less likely to complete them than individuals scoring at the higher level".[35] See below for the descriptions of each level.

Definitions of skill proficiency levels

	Literacy	Numeracy
5	Tasks may require the respondent to search for and integrate information across multiple dense texts; construct syntheses of similar and contrasting ideas or points of view; or evaluate evidence-based arguments. Application and evaluation of logical and conceptual models of ideas may be required to accomplish tasks. Evaluating reliability of evidentiary sources and selecting key information is frequently a key requirement.	Tasks require the respondent to understand complex representations as well as abstract and formal mathematical and statistical ideas, possibly embedded in complex texts. Respondents may have to integrate multiple types of mathematical information where considerable translation or interpretation is required; draw inferences; develop or work with mathematical arguments or models; and justify, evaluate and critically reflect upon solutions or choices.
4	Tasks may require the respondent to search for and integrate information across multiple dense texts; construct syntheses of similar and contrasting ideas or points of view; or evaluate evidence-based arguments. Complex inferences and application of background knowledge may be needed to perform successfully.	Tasks require the respondent to understand a broad range of mathematical information that may be complex, abstract or embedded in unfamiliar contexts. These tasks involve undertaking multiple steps and choosing relevant problem-solving strategies and processes.
3	Texts are often dense or lengthy, and include continuous, noncontinuous, mixed or multiple pages of text. Understanding text and rhetorical structures becomes more central to successfully completing tasks, especially navigating complex digital texts. Tasks require the respondent to identify, interpret or evaluate one or more pieces of information, and often require varying levels of inference.	Tasks require the respondent to understand mathematical information that may be less explicit, embedded in contexts that are not always familiar and represented in more complex ways. Tasks require several steps and may involve the choice of problem-solving strategies and relevant processes.
2	The medium of texts may be digital or printed, and texts may comprise continuous, noncontinuous or mixed types. Tasks in this level require the respondents to make matches between the text and information, and may require paraphrasing or low-level inferences. Some competing pieces of information may be present.	Tasks require the respondent to identify and act on mathematical information and ideas embedded in a range of common contexts where the mathematical content is fairly explicit or visual with relatively few distractors.
1	Most of the tasks require the respondent to read relatively short digital or print continuous, noncontinuous or mixed texts to locate a single piece of information that is identical to, or synonymous with, the information given in the question or directive.	Tasks require the respondent to carry out basic mathematical processes in common, concrete contexts where the mathematical content is explicit with little text and minimal distractors.
< 1	The tasks at this level require the respondent to read brief texts on familiar topics to locate a single piece of specific information. There is seldom any competing information in the text and the requested information is identical in form to information in the question or directive.	Tasks require the respondent to carry out simple processes such as counting, sorting and performing basic arithmetic operations with whole numbers or money, or to recognize common spatial representations in concrete, familiar contexts where the mathematical content is explicit with little or no text or distractors.

Notes

1. See OECD (2015).
2. See Statistics Canada CANSIM table 282-0004.
3. See Hou and Zhang (2015).
4. See Sorensen (2013); Tal and Enenajor (2013); Marr (2013).
5. See OECD (2016).
6. See Frenette and Morissette (2014).
7. See Uppal and LaRochelle-Côté (2014) for a study on overqualification based on National Household Survey and census data. The Office of the Parliamentary Budget Officer (PBO, 2015) recently released a study based on Labour Force Survey data, which indicated that overqualification rose during the 1990s, albeit by only a few percentage points.
8. See Uppal and LaRochelle-Côté (2014).
9. The lower skills of some university graduates is not an issue that is limited to foreign-born workers. For instance, Hango (2014) finds that approximately 16% of university graduates who were born in Canada had lower literacy skills (level 2 or less).
10. This method is largely used in the literature, given that it can be used in other datasets such as the Labour Force Survey (LFS) and the Census. Recent examples include Ledent et al. (2014) and Bourdabat and Montmarquette (2013). This method was also referred to as "over-education" in an earlier Statistics Canada study (Boothby, 2002).
11. See Rainville (2013). The NOC gets updated every five years, but remains largely inspired from a classification of occupations that was made several decades ago.
12. See Hartog (2000) and Rainville (2013).
13. Not all respondents who are "overqualified" on the basis of the NOC classification necessarily report that they are overqualified on the basis of the self-reported measure. See *Data sources, methods and definitions* for a discussion of the overlap between the two measures.
14. The WA method is not without caveats, either. Hartog (2000) raises the possibility that some respondents may overstate the skill requirements of their jobs. Boothby (2002) refers to the fact that some employers may hire workers on the basis of "the availability of persons with a given level of education, rather than genuine requirements of the job".
15. Another method, called "realized matches" (RM), is based on the extent to which workers in a given occupation deviate from the average level of education within the occupation (see Hartog, 2000). However, because the RM measure is a relative one, the average worker may not be representative of the skills requirements for a given occupation.
16. See Statistics Canada et al. (2013). PIAAC's definition of numeracy is designed to evaluate how mathematical concepts are applied in the real world rather than whether an individual can solve a set of equations in isolation.
17. Previous work using earlier skills surveys has suggested that an important demarcation in skill level is observed between proficiency levels 2 and 3. Individuals below level 3 may not have mastered the minimum foundation of literacy needed to attain higher levels of performance, while those at level 3 and above typically had positive economic, social and educational outcomes (see Murray et al. 1997; Statistics Canada 2005; Tuijnman 2001). While this distinction has not been made using PIAAC, university graduates are expected to at least have skills that correspond to the third proficiency level since many high-skilled occupations require competencies at this level.
18. See Uppal and LaRochelle-Côté (2014).
19. Before PIAAC, the other survey of adult literacy was called the International Adult Literacy Survey (IALS). Another study based on 1994 IALS data also found a close relationship between literacy skills and job-education mismatch in Canada (Boothby, 1999).
20. See Statistics Canada and OECD (2005).
21. Because the number of Canadian-born workers who have a foreign degree is very small in the PIAAC sample, the Canadian-born with a foreign degree have been regrouped with those who have a degree from a Canadian institution.
22. The selectivity of marriage refers to the fact that married people (or those in common-law relationships) consistently have better labour market outcomes than those who are unmarried, even after controlling for other characteristics (see Korenman and Neumark 1991).
23. In a previous study based on IALS, Boothby (1999) finds that fewer literacy and quantitative activities are performed by workers in lower skilled occupations.

24. These measures of activities performed in the workplace are guided by, yet differ somewhat from, those in OECD (2013). Specifically, the current measures do not differentiate between information processing skills and "other" generic skills—instead they combine them in certain instances. For example, generic skills in this document combine measures on interaction (which includes items related to co-operation and influence), organization (which includes items related to organization and planning) and problem solving. Meanwhile, the literacy-related measure combines items on reading and writing. A more detailed breakdown of these measures is available from the authors upon request.
25. The large gap in the use of ICT activities between those who were in a high school-level position and those who had a university-level position may be related to the fact that ICT skills likely play a critical role in a number of higher-skilled jobs.
26. See, for instance, Green and Zhu (2010); Quintini (2011); Vaisey (2006).
27. See Frenette (2004); Uppal and LaRochelle-Côté (2014).
28. See Mohr and Zoghi (2008); Uppal (2005); Zeytinoglu et al. (2007).
29. One exception is explored by Chowhan et al. (2012) using the Workplace and Employee Survey (WES). While their study did include a measure of overqualification, their study design did not allow for a disentangling of the effect of overqualification on the level of job satisfaction among university-educated workers.
30. The job satisfaction categories were collapsed in this study for simplicity in modelling the ordered probits. The percentage of university graduates at each level of satisfaction were the following: extremely dissatisfied: 1.1%; dissatisfied: 4.3%; neither: 10.3%; satisfied: 53.3%; and extremely satisfied: 31.0%. A similar pattern was observed across all education levels.
31. See Uppal (2005) for other work using a similar method.
32. In some supplementary models, a measure of flexibility and choice in the way work is carried out was included. Since it did not alter the association between overqualification and job satisfaction above and beyond the already listed factors, it was not included in the final models.
33. See Frenette (2014).
34. See Hango (2014).
35. See Statistics Canada et al. (2013) for additional details.

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